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Volume IV
Photographic Documentation

Soleduck
Revegetation
Project

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Road

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Photographic Documentation

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PROJECT OVERVIEW

PURPOSE AND NEED

Between February 1987 and October 1988, about 12 miles of the Soleduck valley road, between U.S. Highway 101 and the Sol Duc Hot Springs Resort, were reconstructed under a Federal Highway Administration (FHWA) contract funded by the Federal Lands Highway program (FLHP). Because of concern about impacts on the old growth forest stands that border nearly two-thirds of the alignment, the reconstructed road incorporates a number of unique or experimental features. Examples of these unique elements are wooden retaining walls of an unusual design, intended to reduce clearing impacts, and a large-scale, experimental revegetation effort intended to mitigate visual impacts and assist the reestablishment of native forest vegetation.

The Soleduck revegetation project was extensively documented with photographs between spring 1986 and fall 1988. These photographs cover every aspect of the project from initial reconnaissance to experimental test plots to native plant propagation to actual planting. As part of the long-term documentation of the project, a series of centerline and slope photographs were selected to be retaken each year for the next five years and at less frequent intervals after that.

The majority of the photographic record is the work of the two individuals who served as project photographers. This report summarizes the results of their efforts: the types of photographs taken, methods and procedures used, proposed ongoing monitoring, and recommendations for photographic documentation of future park roads projects. Appendix A contains directions for retaking the project monitoring photos.

REVEGETATION PROJECT SUMMARY

As part of the Soleduck road reconstruction, the National Park Service requested and received funding from the Federal Lands Highway Program (FLHP) for a revegetation program. The starting point for the program was NPS management's wish to restore the reconstructed road slopes in a manner appropriate for a western park road through an old growth forest. Rather than reproducing the wide grassy road shoulders typically found along interstate highways and eastern parkways, management wanted to restore the visual character of the preconstruction road slopes. Because these slopes were originally covered with a variety of native shrubs, tree seedlings, ferns, herbs, and some grasses, a primary goal of the revegetation program was to assist the recovery of native forest species on the new cuts and fills. Other goals were to control erosion and to protect local gene pools.

The original revegetation program was developed in the summer of 1985 under the assumption that road construction would begin the following fall. The initial approach was relatively simple. Most cuts and fills would be hydroseeded for erosion control with a short-lived nurse crop. High visibility slopes would be planted with sword fern (*Polystichum munitum*), Douglas fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), and other native plants salvaged from the construction zone or transplanted directly from nearby native communities.

Delays, which pushed the start of construction back to February 1987, gave the revegetation project additional planning and preparation time. Under the new schedule, it

was possible to develop a comprehensive program which included the following elements:

1. Initial hydroseeding for erosion control on the majority of the steep cuts and fills. A short-lived nurse crop consisting of a sterile wheat hybrid (*Agropyron x Triticum*) and annual ryegrass (*Lolium multiflorum*) was used in this first seeding. The intent of this approach, suggested by Park Botanist Edward Schreiner, was to control erosion with fast-establishing species that would not persist in the Soleduck environment. The nurse crop would hold the slopes until they were colonized by natives.

2. Mulching selected areas with locally collected duff, litter, and rotted wood which contained native seed, roots, and other propagules.

3. Planting the steepest, most highly visible cuts with over 42,000 native ferns, shrub tubelings, and tree seedlings in the fall of 1987 and the spring and fall of 1988. Seventy-five percent of these transplants were either salvaged from the construction zone or were propagated from seed or cuttings collected in the Soleduck drainage. The remainder were grown from certified seed collected in the same seed zone and elevation bands as the project area.

4. Reseeding the areas that had not been planted in the fall of 1988. The mix used for this seeding was basically the sterile wheat/annual ryegrass mix. Blue wildrye, a native grass grown from Soleduck seed by the U.S. Soil Conservation Service (SCS), was added to the mix in most areas (11 of 16 hydroseeder loads). Other natives were added to the mix in smaller amounts in selected areas.

5. Seeding approximately 6 miles of ditch area with a mix of mat forming grasses to control erosion and prevent invasion of woody species close to the asphalt roadway.

THE PROJECT PHOTOGRAPHIC RECORD

CENTERLINE SERIES

Several series of slides were taken from regularly spaced points along the projected centerline of the new road. Their purpose was to capture the general character of the preconstruction views up the road. These slides would then be compared with views from the same points photographed during construction, immediately after revegetation, and in succeeding years.

The 1,000′ Color Centerline Series

The revegetation crew took a set of color slides looking up the road (toward the Sol Duc Hot Springs Resort) from photo points about 1000 feet apart on the projected centerline (see photos 1-3). The series was first shot in May 1986, about nine months before clearing and grubbing began. (The location of the new centerline had been surveyed and marked by that time.)

As of spring 1990, this photo series has been retaken three times. A set of preplanting retakes was begun in fall of 1987 and finished in spring of 1988. The preplanting photos could not be shot at one time because we wanted all the slopes to be finish graded when photographed for this series. The slopes above station 210+00 were not that far along when planting began on the lower slopes in the fall of 1987. Second and third sets of retakes were completed in fall 1988 and spring 1989. These sets are supplemented by a sequence of centerline shots taken in fall 1988 by Assistant Superintendent John Teichert using the revegetation project photo points. Although these photographs do not match the previous series quite as well as the fall 1988 project photographs, they were taken under better lighting conditions and give a better picture of the changes on the road (see photos 4-5).

The 100′ Centerline Series

In spring 1986, at the same time the color slides were taken, the revegetation crew also did a series of black and white prints spaced about every 100 feet along the new centerline. The rationale for the black and white series was that it would comprise the permanent project record and would be useful in publications. In 1987, because the crew was pressed for time, the 100-foot black and white series was discontinued. The 1000-foot color slides could be retaken in about one-third the time and were proving to be more useful.

Other Centerline Series

Assistant Superintendent John Teichert took two sets of color slides about 100 feet apart from centerline before and after construction and revegetation. This series gives a good picture of the changes caused by road construction and is a valuable supplement to the project photographers′ work.

Cathleen Wilson

Photo 1: Color centerline series (1,000 ft), station 250+60 (mile 4.7), before construction, May 1986.

Cathleen Wilson

Photo 2: Color centerline series (1,000 ft), station 260+59 (mile 4.9), before construction, May 1986.

Cathleen Wilson

Photo 3: Color centerline series (1,000 ft), station 270+34 (mile 5.1), before construction, May 1986.

Ben Alexander

Photo 4: Color centerline series (1,000 ft), station 260+59 (mile 4.9), during construction, March 1988 (compare with photo 2).

John Teichert

Photo 5: Color centerline series (1,000 ft), station 260+59 (mile 4.9), after construction, May 1989.

Ben Alexander

Photo 6: Road slope series, stations 52+32 to 54+00 (miles 0.99 to 1.0), before revegetation, August 1987.

Cathleen Wilson

Photo 7: Road slope series, stations 52+32 to 54+00 (miles 0.99 to 1.0), after revegetation, May 1989.

SOLEDUCK ROAD SLOPE PHOTOS

This set of color slides depicts conditions on particular Soleduck road slopes before and after revegetation (see photos 6-7). The first version was taken in the fall of 1987 and spring of 1988. From the resulting slides, a set was selected to be retaken yearly for long-term documentation. This series has been retaken in fall 1988 and spring 1989.

REVEGETATION TECHNIQUES

Color slides and sequences documenting revegetation techniques were taken whenever possible. Topics covered include:

Applying native mulch of duff, litter, and woody debris
Salvaging ferns (see photos 8-15)
Field-layering vine maple
Planting steep slopes from ropes
Transplanting trees with the tree spade
Watering with the water truck and pump
Slopes seeded with the sterile wheat hybrid
Construction of the greenhouse propagation bench
Collecting and preparing semihardwood cuttings
Mixing soil in the greenhouse
Overwintering the greenhouse plants

Most of these photos were taken in fall 1987 and spring 1988.

Ben Alexander

Photo 8: Revegetation techniques, fern salvage sequence, digging sword (**polystichum munitum**) fern on preconstruction road slope, July 1987.

Ben Alexander

Photo 9: Revegetation techniques, fern salvage sequence, July 1987.

John Teichert

Photo 10: Revegetation techniques, fern salvage sequence, preparing burlap "ferny-gurney," July 1987.

Ben Alexander

Photo 11: Revegetation techniques, fern salvage sequence, transporting ferns to storage trench, July 1987.

Ben Alexander

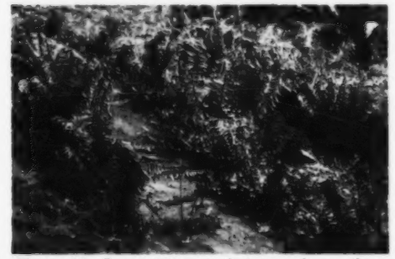
Photo 12: Revegetation techniques, fern salvage sequence, transporting ferns, July 1987.

Ben Alexander

Photo 13: Revegetation techniques, fern salvage sequence, forest storage trench, July 1987.

Ben Alexander

Photo 14: Revegetation techniques, fern salvage sequence, placing ferns in storage trench, July 1987.



Ben Alexander

Photo 15: Revegetation techniques, fern salvage sequence, forest storage site, July 1987.

SOLEDUCK REVEGETATION CREWS

These color slides record the activities of the various crews that worked on the project between 1986 and 1988: the NPS biological technicians who did the majority of the planting, the tree spade crew, Youth Conservation Corps (YCC), high school volunteers, and adult volunteers. They complement the road slope photos and the sequences depicting revegetation techniques (see photo 16).

STUDY PLOTS PHOTOS

During the 1986 field season, the project photographer recorded the progress of five separate test plantings around Lake Crescent: Shady Mound, Bovee's Meadow, Milepost 222 on the Lake Crescent Highway, La Poel, and Marymere Falls. Both black and white prints and color slides were taken (see photo 17). Prints and slides were retaken throughout the first field season (until November 1986). In June 1987, a complete set of color slides was retaken at each of these sites by Ben Alexander.

In October 1986, percent cover data were collected on 50 typical vegetation patches along the preconstruction Soleduck road. Each patch was also photographed resulting in a set of color slides that give a good representation of the character of the preconstruction road slope vegetation (see photo 18).

Selected photographs have been taken of the transplant mortality and colonization studies set up in 1987 and 1988 (see photo 19).

SOLEDUCK ROAD PLANTS

Thirty-six native species and three common alien species found along the Soleduck road were recorded on color slides. These slides depict the characteristic features of each plant: flowers, fruit, seedheads, and foliage. The series provides a good overview of the range of plant materials present in the area (see photo 20).

In addition, a number of general greenhouse photographs were also taken. These display the various plants propagated in the park nursery. Other photographs included tubelings and bareroot trees from private contractors, new growth on the tree-spaded trees the spring after planting, and several species regenerating from roots on scraped slopes.

VISTA CLEARING PHOTOGRAPHS

This set of color slides, originally taken in the fall of 1986, depicts the vistas that will be permanently maintained along the road (see photo 21).

SOLEDUCK ROAD SPECIAL TOPICS

The photographic record also includes various slides and photographs that do not fit easily into any of the previous categories: shots of the greenhouse (see photo 22), roadside storage nurseries and duff and litter stockpiles, miscellaneous photos of old growth forest scenes, road slope erosion during the winter of 1986, and photographs used for presentations and publications, etc.

Ben Alexander

Photo 16: Revegetation crews, station 10+00 (mile 0.2) right, niological technicians planting from ladders, November 1987.

Cathleen Wilson

Photo 17: Study plot series, Barnes Point, Shady Mound study plot 2, after planting, April 1986.

Robin Reid

Photo 18: Study plot series, Soleduck Road reconnaissance plot SD-60, before construction, October 1986.

Ben Alexander

Photo 19: Study plot series, transplant mortality study, tagging transplants, November 1987.

Ben Alexander

Photo 20: Soleduck Road plants, red elderberry (*sambucus racemosa*), July 1987.

Cathleen Wilson

Photo 21: Vista clearing series, station 180+37 (mile 3.4), before construction, October 1986.

Ben Alexander

Photo 22: Special topics, greenhouse interior, August 1987.

METHODS

EQUIPMENT AND SUPPLIES

Most photographs were taken using a 35mm single lens reflex camera with a 50mm lens. A wide-angle lens was used to record some of the study plots. The camera most frequently used was the Nikon belonging to the Olympic Division of Natural Science Studies (NSS).

A tripod was used to take many of the road slope photos. The project photographer found that, in some cases, a hand-held camera did not produce satisfactory photos because the aperture had to be opened too wide for good depth of field (see technical problems below).

Project photographers used Kodachrome 64, Ektachrome 200, and Ektachrome 400 for color slides. Plus-X Pan 125 was used for black and white prints. The Kodachrome gave the best results, but it could only be used in open areas on sunny days. Even in midsummer, the shade of the old growth forest is too dark for the Kodachrome. Ektachrome 200 was the type of film used most frequently, but even this film was insufficient on cloudy days. In fact, during a rainy day on the Soleduck, Ektachrome 400 was barely adequate.

Additional equipment and supplies included: film handling gloves, slide storage sheets, compressed air for cleaning film and equipment, and a hand lens for viewing slides.

TECHNICAL PROBLEMS

The main technical problems encountered by project photographers were difficult lighting conditions and poor depth of field on slope photos.

As noted in the EQUIPMENT AND SUPPLIES section, the most frequent problem was insufficient light. The partial solution was to accept lower quality pictures and use 200 and 400 ASA film. At times, particularly on rainy days in the spring and fall, even these films were insufficient.

Bright, sunny days were also less than ideal. Although there was enough light, high contrast was a problem in areas that were not either totally open or totally shaded. Exposures had to be bracketed to show the part of the scene in shade as more than a black shadow. This method was not always effective. Automatic cameras did not work well.

Another problem was encountered taking slope photographs with a handheld camera. Even shooting 400 ASA film on sunny days, the project photographer often had to open the aperture too wide for good depth of field. Consequently, he started taking all slope shots with a tripod and cable release, stopping the aperture as far down as possible. This increased exposure time to 1/4 second or longer, but gave much better results.

RECORDING AND RELOCATING PHOTO POINTS

In 1986, the locations of the photo points for the 100-foot and 1000-foot series were recorded by taking compass bearings from a fixed reference point to the photo point. The crew planned to use permanent landmarks outside the clearing limits as references for the photo points. This was possible in some places, but many times a combination of dense vegetation and/or wide clearing limits forced them to use either survey stakes marking the clearing limits or reference point stakes indicating centerline. Between the time the series were first shot and the fall of 1987 when a new project photographer began retaking the 1000-foot series, the road was resurveyed and restaked by FHWA to reflect a number of design changes. The old station numbers were, however, close enough to the new stationing to be useful in finding the general locations of the photo points. Once the photographer was in the general vicinity, slides were compared with the scene in the camera viewfinder until the right spot was located.

In the fall of 1987, the relocated photo points were recorded again by taking a compass bearing from the nearest 500-foot station marker. In the spring of 1988, because the project photographer was working alone, the bearing was taken from the photo point to the station marker (these were white cardboard signs with black station numbers printed on them in a large typeface, making them easy to locate even at a distance).

When the 1000-foot series and the slope photos were retaken in the fall of 1988, the white station markers were still up, making it reasonably easy to find the general locations of the photo points. Using the slides to relocate the points proved to be easier than using the compass bearings. Because the large 500-foot station markers were scheduled for removal, a paper milepost system was developed to help relocate the photo points.

By the time the spring 1989 retakes were shot, the 500-foot station markers had mostly been removed. The photo points were relocated using the slides and the paper milepost system. This system related mileages and station numbers to the locations of relatively permanent features like turnouts, culverts, and bridges. It can be used to find the general vicinity of the photo point. The slides are then used, as before, to find the exact spot.

DATA SHEETS

The Photo Data Sheet illustrates the data sheets used to record photographic information. Recording exposure settings was discontinued. By the end of the project, data taken included film type, camera used, photographer, date, weather, frame number, and road station number (location).

LOGISTICS AND SCHEDULING

Some of the centerline photos and the majority of the rest of the photographic record were taken by the project photographer working alone. The 1986 centerline series was shot by the revegetation crew working in teams of two: a photographer and a data recorder. Most of the succeeding centerline retakes were done by the project photographer working with an assistant who recorded data and helped locate the photo points.

Scheduling was often a problem for project photographers; sometimes their other duties interfered with plans to take pictures. For example, during the fall 1987 planting season,

Photo Data Sheet

Name _____ Project _____

Date _____ Weather _____

Film Type _____ Camera Used _____

Lens Size _____ Roll # _____

NOTES: _____

Map #	Exp #	Bearing	Photo Pt. #	Mileage/ Station #	F-Stop	Shutter Speed	Description

the project photographer also served as a planting crew leader on a rotating basis. Scheduling "before" pictures was a problem because he sometimes was not on the road when a slope was started. When he was present, his attention was usually most needed by the crew when they started a new slope. The problem was compounded by the unpredictability of the road contractor. His construction crew was behind schedule, so the revegetation crew often did not know until the last minute when a slope would be ready.

Other factors affecting scheduling were: traffic on the road (when the road was open, centerline shots had to be taken before the end of May or after Labor Day) and the need to plan photography for days and times of day when there was enough light.

PHOTO STORAGE AND ORGANIZATION

Each slide, contact sheet, or print was identified by a roll and frame. The following information was written on the picture: roll number, date taken, photographer's initials, and brief description of the subject. On slope and centerline slides that will be retaken for long-term monitoring, the photo point is sometimes briefly described (e.g., planted slope at mile 9.56 or 505+00 left from mile 9.51 or 502+00 right). This practice was begun during the 1987-1988 season to aid in relocating photo points.

All pictures are stored in archival plastic film protectors and filed by subject matter in 3-ring binders. The binder titles are: Soleduck Road Centerline Series, Soleduck Road Slope Photos, Soleduck Revegetation Techniques and General Greenhouse, Soleduck Revegetation Crews, Soleduck Road Study Plot Photos Volumes I and II, Soleduck Road Plants, Soleduck Vista Clearing Photographs, and Soleduck Road Special Topics. Within binders, material is organized chronologically or by subject as appropriate. Some frequently used sequences (e.g., the ones on salvaging fern and propagation of semihardwood cuttings) have been pulled out and filed in "slideshow" storage sheets at the beginning of each pertinent subheading in the appropriate binder.

The Assistant Superintendent's 100-foot centerline series is on file at Olympic National Park. The remainder of the photographic record is on file at the Denver Service Center.

ONGOING MONITORING

For ongoing project documentation, selected road slope photos and the 1000-foot centerline series will be reshot each spring for five years. After 1994, the series should be reevaluated. Directions for retaking the slides are found in APPENDIX A.

A copy of this document with a complete set of monitoring slides is on file at Olympic National Park. A second set is on file in the Technical Information Center at the Denver Service Center.

RECOMMENDATIONS FOR FUTURE ROAD PROJECTS

1. **Planning** – The types of photographs to be taken and a general schedule for taking them should be part of project planning. Appointing a project photographer helps to ensure that the plan will be carried out, but potential scheduling difficulties need to be kept in mind, since the responsible person will also have other duties.

2. **Types of photographs** – On the Soleduck project, the most useful photographs have been the "before" and "after revegetation" color slides of entire slopes. They give managers and the general public a good overview of the changes brought about by construction and the revegetation effort. If only limited time is available for photography, a set of before and after pictures like the Soleduck slope photographs should be the first priority. They can be supplemented with close-ups of study plots or features of particular interest.

Sequences like the plant salvage series which illustrate revegetation techniques are also very useful.

For projects like the Soleduck which involve continuous clearing and extensive reconstruction along the length of the alignment, centerline photographs help to document how the visual character of the road changes. Where only selected slopes are being restored, a centerline series is not needed. The 1000-foot spacing is the minimum necessary; the 100-foot series gives a more complete picture.

Study plot photographs should be taken as part of regular data collection. Both black and white and color photographs are useful. Black and white prints can be made from color slides by making internegatives, but this process is expensive if many prints are needed.

3. **Establishing a system of reference points for finding photo points and study plots** – Ideally a milepost system, keyed to permanent features of the landscape, would be set up prior to construction. In reality, on a major road reconstruction, useable features like turnouts, culverts, and large trees may or may not be there when the project is finished. Really permanent features like rivers do not occur very frequently.

What will probably be needed is a temporary system keyed to the construction survey stakes which can later be translated into a permanent system keyed to permanent markers or features of the new road or both. In setting up the temporary system, do not work from clearing limit stakes (usually marked with stationing and the letters CL). They will be removed during construction. Try to use the reference point stakes (usually marked with the stationing and the letter RP). Reference point stakes are deliberately set beyond the clearing limits so the centerline can be relocated during construction. Remember that design changes can cause the road to be resurveyed. It is a good idea to include some permanent landscape features that are outside the project clearing limits in the temporary system.

A number of permanent systems were discussed for use on the Soleduck road after construction. Metal caps in the pavement on centerline were rejected because they would be paved over or removed by maintenance equipment. Visible markers along the side of the road were rejected for aesthetic reasons. The Federal Highway Administration will eventually prepare a paper milepost system relating mileages to turnouts, bridges, and other features on the new road. As noted previously, the revegetation crew prepared a temporary

paper milepost system of this type. The park is also considering placing unobtrusive markers every 2000 feet at the sites of some of the old 500-foot station signs. The final system will probably combine these markers with a paper milepost system.

4. **Data recording** – Data recording methods became much simpler toward the end of the Soleduck project. The photographers found that the important information to record was film type, camera used, photographer, date, weather, frame number and road station number (location).

For monitoring photos, retaken repeatedly from the same spot, the photographer's standpoint should also be recorded. Maps and compass bearings showing the photo point are helpful. The system we found worked best was (1) a series of references to survey stakes and landmarks to help the photographer find the general location and (2) a set of slides or contact sheets to locate the exact spot.

5. **Ongoing monitoring** – At the very least, a monitoring program should consist of a series of "before" and "after" slopes photographs. Before and after close-ups of study plots on the revegetated slopes and a set of centerline photographs are also desirable.

Photographs should be retaken annually for five years after planting and at less frequent intervals after that.

APPENDIX A: RETAKING THE PROJECT MONITORING PHOTOGRAPHS

Ongoing monitoring of the Soleduck revegetation plantings consist of annually retaking a set of slope photographs and the 1000' centerline series. If there is not enough time to retake both the slope photos and the centerline series, the slope series should be first priority.

FINDING THE PHOTO POINTS

This appendix contains the following information to help relocate the photo points for the slope and centerline series:

Tables 1 and 2 list the station numbers of the slopes pictured in the slides. They also include information on the photographer's location.

Complete sets of the slope and centerline slides to be retaken are on file at Olympic National Park and the Denver Service Center Technical Information Center. Location information on the site depicted is written on the slide frame.

In interpreting the station numbers, it should be remembered that 250+00 means 25,000 feet from the beginning of the road. The designations "left" and "right" always assume the viewer is looking up the road toward the resort and away from Highway 101.

Appendix B contains the temporary paper milepost system developed by the revegetation crew. It relates station numbers to features on the new road and to mileages. (The mileages become increasingly inaccurate as one proceeds up the road because they were recorded from an automobile odometer.)

The paper milepost system can be used to locate the general vicinity of the photo points. The exact photo points can be located using the slides. In the past, it has helped to have two people relocating the photo points: one drives while the other navigates using the milepost system and the slides.

EQUIPMENT AND SUPPLIES

35mm camera
film ASA 200 or 400 (slides)
data sheets or "Rite-in-the-Rain" notebook for data recording
a full set of the slides to be reshot
a tripod
a copy of the paper milepost system
a set of the Soleduck road plans
data sheets from previous retakes

DATA RECORDING

Record film type, camera used, photographer, date, weather, frame number, and station number.

TIMING

The monitoring photographs should be retaken every spring in May. It is important to do this before there is so much traffic on the road that it becomes impossible to stand on centerline with a tripod.

Table 1. Centerline Retakes

0+00	mile 0	309+67	mile 5.86
10+51	mile 0.20	319+78	mile 6.06
21+32	mile 0.40	329+94	mile 6.25
31+32	mile 0.59	339+84	mile 6.43
41+35	mile 0.78	350+23	mile 6.63
50+32	mile 0.95	360+85	mile 6.83
60+24	mile 1.14	370+57	mile 7.02
70+24	mile 1.33	380+92	mile 7.21
80+25	mile 1.52	390+85	mile 7.40
90+25	mile 1.71	400+55	mile 7.59
100+55	mile 1.90	410+68	mile 7.78
110+98	mile 2.10	420+74	mile 7.97
120+74	mile 2.29	430+75	mile 8.16
130+72	mile 2.48	439+86	mile 6.63
140+62	mile 2.66	450+66	mile 8.54
150+75	mile 2.86	459+57	mile 8.70
160+79	mile 3.05	470+10	mile 8.90
170+59	mile 3.23	480+36	mile 9.10
180+72	mile 3.42	490+40	mile 9.29
190+44	mile 3.61	500+52	mile 9.48
200+36	mile 3.79	510+08	mile 9.66
200+56	mile 3.80	520+43	mile 9.86
210+12	mile 3.98	530+25	mile 10.04
220+23	mile 4.17	540+25	mile 10.23
230+22	mile 4.36	550+61	mile 10.43
240+16	mile 4.55	560+46	mile 10.61
250+00	mile 4.73	570+17	mile 10.80
260+00	mile 4.92	580+91	mile 11.00
269+80	mile 5.11	590+83	mile 11.19
280+00	mile 5.30	600+54	mile 11.37
289+50	mile 5.48	610+32	mile 11.56
299+60	mile 5.67	620+07	mile 11.74

Table 2. Slope Retakes

left 5+00 from 4+42 centerline	left mile 0.09 from mile 0.08 centerline
right 6+72 from 6+67 centerline	right mile 0.12 from mile 0.13 centerline
6+67 centerline	0.13 centerline
left 10+00 from 8+70 centerline	left mile 0.19 from mile 0.16 centerline
right 10+00	right mile 0.19
left 14+00 treespaded alder	left mile 0.27
left between 14+00 and 16+00 (Cam's rock) from 13+95 centerline	left between mile 0.27 and mile 0.30 from mile 0.26 centerline
left Cam's rock from 16+30 centerline	left Cam's rock from mile 0.31
right 20+00	right mile 0.38
left 50+50 #1	left mile 0.96 #1
left 50+50 #2	left mile 0.96 #2
left 50+50 #3	left mile 0.96 #3
left 50+82 to 51+50	left mile 0.96 to mile 0.98
left 51+00 from 50+82 right	left mile 0.97 from mile 0.96 right
left 52+32 to 54+00	left mile 0.99 to mile 1.02
left 57+00	left mile 1.08
left 64+00	left mile 1.21
left 65+00	left mile 1.23
left 70+00	left mile 1.33
left 75+50 from 75+00 right	left mile 1.43 from mile 1.42 right
left 76+00	left mile 1.44
centerline at 76+75 looking north	centerline at mile 1.45
left 79+00 from 40′ below culvert on right	left 1.50 from 40′ below culvert on right
left 105+00 #1	left mile 1.99 #1
left 105+00 #2	left mile 1.99 #2
105+00 from centerline	mile 1.99 from centerline
left 105+00 #3	left mile 1.99 #3
left 107+00 from 106+30 right	left mile 2.03 from mile 2.01 right
left 109+00	left mile 2.06
left 109+00 from right 108+27	left mile 2.06 from right mile 2.05
right 110+00 from 109+77 left	right mile 2.08 from mile 2.078 left
treespaded trees at 110+00 left	treespaded trees at mile 2.08 left

left 140+00	left mile 2.65
left 150+00	left mile 2.84
left 185+00	left mile 3.50
left 251+00 from 253+73 right	left mile 4.75 from mile 4.81 right
left 251+00 from 250+78 right	left mile 4.75 from mile 4.75 right
left 257+00 from right 256+08	left mile 4.87 from right mile 4.85
left 257+00 from 258+98 right	left mile 4.87 from mile 4.90 right
left 265+00 from 263+45 right	left mile 5.02 from mile 4.99 right
left 515+00 from 516+25 right	left mile 9.75 from mile 9.78 right
left 521+00 from right 519+07	left mile 9.87 from right mile 9.83
left 525+00 from 524+28 right	left mile 9.94 from mile 9.93 right
left 525+00 from 526+54 right	left mile 9.94 from mile 9.97 right
left 567+00 from right 567+00	left mile 10.74 from mile 10.74 right
left 571+00 from 572+58 right	left mile 10.81 from mile 10.84 right
left 571+00 from right 570+26	left mile 10.81 from mile 10.80 right

APPENDIX B: SOLEDUCK ROAD PAPER MILEPOST SYSTEM 9/30/88

Please note that as the distance from the beginning of the road increases, the mileages from the odometer reading became increasingly different from the mileages from converted station numbers. Use a vehicle odometer to find the general location. Use the landmarks and road plans to find the exact spot.

ODOMETER READING	CONVERTED TO MILEAGE	CONVERTED TO DISTANCE IN FEET	FALL 1988 STATIONING	CONVERTED TO MILEAGE	LANDMARKS
Road Entrance to Fee Station					
62282.00	0.00		0+00	0	Junction Hwy 101/Soleduck Rd
62282.05	0.05	264.00	5+00	0.09	5+00 station marker, culvert left and 15 mph sign
62282.15	0.15	792.00			Welcome sign/entrance to interpretive-information station
62282.25	0.25	1320.00			Exit from interpretative station/U.S. Fee area sign
Fee Station to Old Dump Entrance					
62282.30	0.30	1584.00			Fee station kiosk
62282.35	0.35	1848.00	20+00	0.38	20+00 station marker
62282.45	0.45	2376.00	25+00	0.47	25+00 station marker, end of large open hydroseeded slope right
62282.55	0.55	2904.00			1987 colonization plots left
62282.60	0.60	3168.00			Culvert/1987 colonization plots on left above eroded road cut
62282.65	0.65	3432.00	35+00	0.66	35+00 station marker
62282.70	0.70	3696.00			1987 colonization plot left
62282.75	0.75	3960.00	40+00	0.76	40+00 station marker
62282.85	0.85	4488.00	45+00	0.85	45+00 station marker/tree spade slope left
62282.95	0.95	5016.00	50+00	0.95	50+00 station marker/moss mat slope
62283.00	**1.00**	5280.00	52+80	**1.00**	**Mile 1**, moss mat slope left
62283.05	1.05	5544.00	55+00	1.04	55+00 station marker
62283.10	1.10	5808.00			tree spaded/tagged salal slope

62283.15	1.15	6072.00			60+00 station marker/tree spaded slope left
62283.25	1.25	6600.00			65+00 station marker/culvert left Turnout left
62283.30	1.30	6864.00			Culvert small stream
62283.35	1.35	7128.00	75+00	1.42	75+00 station marker/culvert
62283.45	1.45	7656.00	80+00	1.52	80+00 station marker/just past water-barred slope left
62283.55	1.55	8184.00	85+00	1.61	85+00 station marker/culvert just uproad
62283.65	1.65	8712.00			beginning first guardrail right rock wall just ahead
62283.70	1.70	8976.00			End of first guardrail right/rock wall left
62283.85	1.85	9768.00			Small guardrail right/stream left
62283.90	1.90	10032.00			Beginning third guardrail right
62284.00	**2.00**	10560.00			105+00 station marker/long waterbarred slope left
62284.05	2.05	10824.00	105+00	1.99	Culvert left
62284.10	2.10	11088.00			**Mile 2**
			105+60	**2.00**	110+00 station marker/tree
62284.15	2.15	11352.00	110+00	2.08	spaded/salal slope left
62284.25	2.25	11880.00	115+00	2.18	115+00 station marker/old dump entrance left

Old Dump Entrance to Aurora Ridge Trailhead

62284.45	2.45	12936.00	125+00	2.37	125+00 station marker/new dump entrance/culvert left
62284.55	2.55	13464.00	130+00	2.46	130+00 station marker/Aurora Ridge trailhead left

Aurora Ridge Trailhead to New Crossover

62284.65	2.65	13992.00	135+00	2.56	135+00 station marker
62284.75	2.75	14520.00	140+00	2.65	140+00 station marker/culvert left just uproad
62284.85	2.85	15048.00			Culvert and seep left
62284.90	2.90	15312.00			Culvert left
62285.00	**3.00**	15840.00			Turnout right alder/vine maple
			158+40	**3.00**	**Mile 3**
62285.10	3.10	16368.00			Man-made rock wall left

62285.15	3.15	16632.00			Culvert left/old *Oxalis* mat storage site
			165+00	3.13	165+00 station marker
62285.25	3.25	17160.00	170+00	3.22	170+00 station marker/ colonization plot on rocky slope/culvert just uproad
62285.30	3.30	17424.00			
62285.40	3.40	17952.00	175+00	3.31	175+00 station marker/culvert left
			180+00	3.41	180+00 station marker/pond left
62285.50	3.50	18480.00	185+00	3.50	185+00 station marker/culvert/ high, dry rocky slope left
62285.60	3.60	19008.00			Culvert
62285.65	3.65	19272.00	190+00	3.60	190+00 station marker/new Forest Service road crossover left
62285.70	3.70	19536.00			

New Crossover to Old Growth S-Curve

62285.75	3.75	19800.00			Culvert right/big leaf maple stand on left
			195+00	3.69	195+00 station marker
62285.80	3.80	20064.00	200+00	3.79	200+00 station marker/willow (*Salix*) and maple (*Acer*) stands
62285.90	3.90	20592.00			Culvert right
62285.95	**3.95**	20856.00	210+00	3.98	210+00 station marker
62286.10	4.10	21648.00	211+20	**4.00**	**Mile 4**
			213+94	4.05	Old Forest Service road crossover right
62286.20	4.20	22176.00			Culvert left/eroded area above it
62286.25	4.25	22440.00	220+00	4.17	220+00 station marker
62286.30	4.30	22704.00			Culvert and stream left
62286.45	4.45	23496.00	230+00	4.36	230+00 station marker/steep eroded road cut left
62286.50	4.50	23760.00			Beginning of short guardrail right/rock wall left
62286.55	4.55	24024.00			Beginning of guardrail right
62286.65	4.65	24552.00	240+00	4.55	240+00 station marker
62286.70	4.70	24816.00			End of guardrail and stream left
62286.75	4.75	25080.00			

Old Growth S-Curve to Bridge

62286.80	4.80	25344.00	245+00	4.64	245+00 station marker/steep slope left/tagged plants

					Culvert/stream
62286.85	4.85	25608.00			
62286.95	4.95	26136.00	251+00	4.75	Turnout right @251
62287.00	5.00	26400.00	255+00	4.83	255+00 station marker/old road storage site left
					Ground utilities box right
62287.05	5.05	26664.00			
62287.10	5.10	26928.00	260+00	4.92	260+00 station marker/culvert right
			264+00	5.00	**Mile 5**
62287.20	5.20	27456.00	265+00	5.02	265+00 station marker/high steep slope
					Culvert left
62287.25	5.25	27720.00			
62287.29	5.29	27931.20			Culvert left
62287.30	5.30	27984.00	270+00	5.11	270+00 station marker
62287.40	5.40	28512.00	275+00	5.21	275+00 station marker/culvert left/bridge in sight

Bridge to Salmon Cascades

					Bridge
62287.50	5.50	29040.00			Turnout right
62287.55	5.55	29304.00			Two cable boxes/culvert left
62287.70	5.70	30096.00			Beginning guardrail
62287.75	5.75	30360.00			right/unstable slope left
					End of guardrail
62287.85	5.85	30888.00			
62287.90	5.90	31152.00	300+00	5.68	300+00 station marker/1988 colonization plot left
62287.95	5.95	31416.00	305+00	5.78	305+00 station marker
62288.05	6.05	31944.00			Beginning guardrail right/cable box (#012450)
62288.08	6.08	32102.40	310+00	5.87	310+00 station marker/middle of guardrail
					End of guardrail
62288.10	6.10	32208.00			Turnout left/cable box
62288.15	6.15	32472.00			(#013350) culvert just uproad
					Culvert left
62288.20	6.20	32736.00	316+80	6.00	**Mile 6**
62288.30	6.30	33264.00	320+00	6.06	320+00 station marker/turnout just uproad right
62288.40	6.40	33792.00	325+00	6.16	325+00 station marker/large boulder at marker/vista clearing right/culvert just uproad
					Culvert left
62288.45	6.45	34056.00			
62288.48	6.48	34214.40	330+00	6.25	330+00 station marker

62288.55	6.55	34584.00			Culvert left/utilities ground box just uproad right
62288.58	6.58	34742.40	335+00	6.34	335+00 station marker
62288.65	6.65	35112.00			Culvert left
62288.75	6.75	35640.00	345+00	6.53	345+00 station marker/culvert left
62288.85	6.85	36168.00	350+00	6.63	350+00 station marker/turnout right
62288.90	6.90	36432.00			Culvert left
62288.95	6.95	36696.00			Culvert left
62289.00	**7.00**	36960.00			Utilities ground box
62289.08	7.08	37382.40	360+00	6.82	360+00 station marker
62289.18	7.18	37910.40	365+00	6.91	365+00 station marker
62289.20	7.20	38016.00			Culvert and stream bed left
			369+60	**7.00**	**Mile 7**
62289.25	7.25	38280.00			Culvert
62289.30	7.30	38544.00			Two cable boxes right
62289.35	7.35	38808.00			Vista clearing Salmon Cascades
62289.40	7.40	39072.00			Cable box right
62289.45	7.45	39336.00			Salmon Cascades parking lot

Salmon Cascades to North Fork Trailhead

62289.55	7.55	39864.00			Utilities ground box right/culvert ahead left
62289.68	7.68	40550.40	390+00	7.39	390+00 station marker/Culvert just downroad
62289.70	7.70	40656.00			Culvert left where Soleduck River comes closest to road
62289.75	7.75	40920.00	395+00	7.48	395+00 station marker/parking turnout right
62289.90	7.90	41712.00			Two culverts left/steep bank right
62289.95	7.95	41976.00			Guardrail right/culvert just downroad
62290.00	**8.00**	42240.00			Culvert
62290.05	8.05	42504.00	410+00	7.77	410+000 station marker/middle of guardrail/1988 colonization plot uproad
62290.18	8.18	143190.40			Culvert left/guardrail right
62290.25	8.25	43560.00			Culvert left/guardrail right

62290.28	8.28	43718.40	420+00	7.95	420+00 station marker/culvert left/guardrail right
					Culvert left/guardrail right
62290.30	8.30	43824.00	422+40	**8.00**	**Mile 8**
62290.35	8.35	44088.00	425+00	8.05	425+00 culvert left/guardrail right
62290.40	8.40	44352.00			End of guardrail right/rock wall left
62290.48	8.48	44774.40			1988 colonization plot left
62290.55	8.55	45144.00	435+00	8.34	North Fork trailhead parking
North Fork Trailhead to Meadow Gate					
62290.75	8.75	46200.00	445+00	8.43	445+00 seep below marker/"North Fork Hill"
62290.80	8.80	46464.00			Beginning guardrail
62290.85	8.85	46728.00	450+00	8.52	450+00 culvert left/turnout right/guardrail ends
62290.90	8.90	46992.00			Culvert left uproad from 1988 colonization plot
62290.95	8.95	47256.00	455+00	8.62	455+00
62291.00	**9.00**	47520.00			Culvert left
62291.05	9.05	47784.00	460+00	8.71	460+00
62291.10	9.10	48048.00			"Mini rain forest" turnout right just uproad from culvert left and utilities ground box right
			465+00	8.81	465+00 turnout on left uproad
62291.18	9.18	48470.40	470+00	8.90	470+00
62291.25	9.25	48840.00	475+00	9.00	475+00 "Night Shadows" turnout on right
62291.35	9.35	49368.00			Culvert left
62291.45	9.45	49896.00	475+20	**9.00**	**Mile 9**
62291.50	9.50	50160.00			Beginning guardrail right just uproad from culvert left
62291.55	9.55	50424.00	485+00	9.19	485+00/large Douglas-fir
62291.60	9.60	50688.00			Culvert left/guardrail right
62291.65	9.65	50952.00	490+00	9.28	490+00 culvert left/guardrail right
62291.75	9.75	51480.00	495+00	9.38	495+00 end of guardrail right/cable box (#199650) right
62291.78	9.78	51638.40			Culvert left
62291.80	9.80	51744.00			Culvert left

62291.85	9.85	52008.00	500+00	9.47	500+00
62291.95	9.95	52536.00	505+00	9.56	505+00 turnout left
62292.05	**10.05**	53064.00	510+00	9.66	510+00 fern slope left
62292.15	10.15	53592.00	515+00	9.75	515+00 steep slope left/moss mat slope right
62292.25	10.25	54120.00	520+00	9.85	520+00 turnout right/culvert and ravine left
62292.30	10.30	54384.00			Culvert left
62292.35	10.35	54648.00	525+00	9.94	525+00
62292.40	10.40	54912.00			Culvert left
			528+00	**10.00**	**Mile 10**
62292.45	10.45	55176.00	530+00	10.04	530+00
62292.50	10.50	55440.00	535+00	10.13	535+00 Cable box (#199150) right/duff and litter slope uproad left
62292.65	10.65	56232.00	540+00	10.23	540+00 culvert left, just downroad
62292.70	10.70	56496.00	545+00	10.32	545+00 culvert and stream just downroad
62292.85	10.85	57288.00	550+00	10.42	550+00 opposite three large Douglas-firs right/culvert and stream just uproad
62292.90	10.90	57552.00	555+00	10.51	555+00 culvert
62292.95	10.95	57816.00			Culvert and wet eroded slope left
62292.05	10.05	53064.00	560+00	10.61	560+00 culvert just uproad/cable box (#309750)
62293.10	**11.10**	58608.00	565+00	10.71	565+00 densely planted conifer slope
62293.15	11.15	58872.00			Culvert midway along dense slope
62293.20	11.20	59136.00	570+00	10.80	570+00
62293.28	11.28	59558.40			Culvert left
62293.30	11.30	59664.00			Culvert left
62293.40	11.40	60192.00			Culvert left
62293.45	11.45	60456.00	580+00	10.90	580+00
			580+80	**11.00**	**Mile 11**
62293.50	11.50	60720.00	585+00	11.08	585+00 culvert left/turnout and cable box (#309450) right
62293.55	11.55	60984.00			Culvert/cable box (#309350) right
62293.60	11.60	61248.00	590+00	11.17	590+00 culvert and seep left/cable box (#309351) right
62293.65	11.65	61512.00			Culvert left

62293.70	11.70	61776.00	595+00	11.27	595+00 culvert and stream left
62293.80	11.80	62304.00	600+00	11.36	600+00 culvert left
62293.90	11.90	62832.00	605+00	11.46	605+00 culvert left/cable box (#309150) right
Meadow Gate to Resort					
62293.95	11.95	63096.00			Gate to Meadow (old barn site)
62294.00	**12.00**	63360.00	610+00	11.55	610+00
62294.05	12.05	63624.00			Culvert
62294.10	12.10	63888.00	615+00	11.65	615+00
62294.15	12.10	64152.00			Reduce speed sign right
62294.18	12.18	64310.40			Culvert and stream/ maintenance road left
62294.20	12.20	64416.00	620+00	11.74	620+00
62294.25	12.25	64680.00			Speed limit 15 mph sign right
62294.30	12.30	64944.00	625+00	11.84	625+00
62294.35	12.35	65208.00			Culvert left
			633+60	**12.00**	**Mile 12**
62294.50	12.50	66000.00	635+00	12.03	635+00 High voltage box/culvert left
62294.55	12.55	66264.00			Sol Duc Hot Springs Resort entrance

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As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural and cultural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people. The department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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IV

Photographic Documentation